

Acupuncture Therapy Results in Immediate Bronchodilating Effect in Asthma Patients

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Background: According to previous data on asthma in the English literature, there are some results that show encouraging effects of acupuncture improving pulmonary function in asthma patients. We designed a prospective randomized crossover controlled study to determine the efficacy of acupuncture in asthma patients.

Methods: Eighteen asthma patients with bronchodilator response >20% improvement of forced expiratory volume in 1 second (FEV₁) were initially randomly assigned to receive 1 performance of real acupuncture (RA) or sham acupuncture (SA) in a blinded manner. After a washout period, the patients were crossed over. Spirometry was done and recorded before and after acupuncture.

Results: Sixteen of 18 patients completed the study. The mean (\pm SD) FEV₁ values before and after RA were 1.52 ± 0.45 L and 1.67 ± 0.40 L, respectively ($p < 0.001$). The mean (\pm SD) FEV₁ values before and after SA were 1.49 ± 0.40 L and 1.49 ± 0.41 L, respectively ($p = 0.838$, not significant). The percentage change in FEV₁ values after RA was better than after SA (RA, $11.57 \pm 8.11\%$; SA, $0.32 \pm 7.76\%$; $p = 0.003$), while the bronchodilator response of FEV₁ from simple inhalation bronchodilator was better than that for RA ($p < 0.001$).

Conclusion: In asthma patients, acupuncture treatment may result in immediate improvement of FEV₁, but the degree of improvement is less than that from inhalation bronchodilator. [*J Chin Med Assoc* 2007;70(7):265–268]

Key Words: acupuncture, asthma, spirometry

Introduction

The use of complementary/alternative medicine (CAM) is increasing worldwide, and is also very popular in Taiwan.¹ Many doctors refer patients for CAM treatment. Traditional Chinese medicine (TCM) has claimed the ability to favorably influence the course and symptoms of many chronic conditions. Acupuncture, one importance practice of TCM, has been used for thousands of years, and many patients believe that it is effective in the treatment of many chronic conditions, including asthma.^{2,3} Some reports described the possible mechanism of acupuncture⁴ and the beneficial effect of acupuncture in the treatment of asthma.⁵ Although acupuncture has gained increasing popularity in modern health care, it is usually only for clinical rather than physiologic improvement of the asthma condition.⁶ Up to now, there have been many controversial reports, but

only a few controlled studies have been designed to determine the efficacy of this treatment. Here, we designed a prospective controlled crossover study to evaluate the immediate physiologic response to acupuncture in asthma patients.

Methods

Study design

Patients with persistent asthma who were >35 years of age and visiting our outpatient clinic at the Kaohsiung Veterans General Hospital were screened for participation in the study. Inclusion criteria were as follows: forced expiratory volume in 1 second (FEV₁) values between 45% and 80% of the predicted value, as calculated with respect to age and height; FEV₁/forced vital capacity (FVC) <70%; patients interested in receiving

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acupuncture as an alternative therapy for asthma treatment; and at least 20% improvement in FEV₁ after the inhalation of β_2 -agonist medication within 7 days before acupuncture in any pulmonary physiology laboratory. Patients were excluded if they had been treated for acute asthma attack within 1 month before the study, had been hospitalized for asthma within 3 months before the study, had an upper or lower respiratory tract infection within 1 month before the study, had received systemic corticosteroid therapy within 1 month prior to the study, used inhaled rapid-onset β_2 -agonist regularly by themselves, or had changed their medication for asthma due to deterioration of symptoms within 1 month prior to the study. However, fixed-dose inhalation of corticosteroid or combination therapy was allowed throughout the test. Patients were initially randomly assigned to receive either real acupuncture (RA) or sham acupuncture (SA) in a blinded manner (i.e. both the patient and evaluator were blinded) and received 1 performance of acupuncture in each session. To avoid the lasting effect of acupuncture treatment, a washout period of 2 to 3 days was arranged. Groups were then crossed over, and patients who had received RA received SA, and vice versa. All the treatment were completed within 5 days. No rescue bronchodilator could be used for 24 hours before each acupuncture treatment. Patients were withdrawn from the study if they delayed receiving the second session of acupuncture (RA or SA) by over 1 day, in the event of a worsening of asthma that required treatment with systemic corticosteroids, or changed medication for asthma.

The protocol was approved by the institutional review board and written informed consent was obtained from all participants.

Acupuncture

Acupuncture was performed by an experienced doctor. Each needle was kept in place for 15 minutes and then removed. All acupuncture sessions were completed within 30 minutes. Sterile, single-use acupuncture needles were used. The needles were manipulated twice to intensify the effect during each session in both groups. For RA, stimulation on acupoints lung 7, large intestine 4, pericardium 6, stomach 40, large intestine 11, and pericardium 3 were used and associated with the sensation of somatosensory reaction, *De Qi*. For SA, 2 points at other than traditional acupuncture points on the extremities and directed to the subcutaneous tissue were selected and only minimal stimulation was done.

FEV₁

After enrolling in our study, patients received spirometry by use of a single KoKo spirometer (PDS

Instrumentation Inc., Louisville, CO, USA) in the same lab by the same technician. Patients were encouraged to perform at least 3 maneuvers during each measurement to meet American Thoracic Society criteria for acceptability and reproducibility. Spirometry was scheduled 5 minutes before, and 20–30 minutes after completion of RA or SA. The highest FEV₁ value from each set of measurements and percentage change in FEV₁ after acupuncture were used for analysis. Δ FEV₁ (%) was calculated using the following equation: Δ FEV₁ (%) = $100 \times (\text{FEV}_1 \text{ after acupuncture} - \text{FEV}_1 \text{ before acupuncture}) / \text{FEV}_1 \text{ before acupuncture}$; and the result was presented as a percentage.

Statistical analysis

Paired *t* test was used to evaluate the treatment effect. A *p* value ≤ 0.05 was considered to be statistically significant.

Results

Sixteen of 18 patients completed the study and were available for analysis. Two patients did not complete the study due to missing the scheduled second session of acupuncture. Twelve patients had received acupuncture as alternative treatment for their acute or chronic condition (including asthma) before. The general data and initial FEV₁ change following bronchodilator within 7 days before the study are presented in Table 1.

FEV₁

There was no difference between baseline FEV₁ before RA and that before SA (RA, 1.52 ± 0.45 L; SA, 1.49 ± 0.40 L; *p* = 0.75, not significant [NS]). The mean (\pm SD) FEV₁ values were 1.52 ± 0.45 L before RA and 1.67 ± 0.40 L after RA (*p* < 0.001). The mean (\pm SD) FEV₁ values were 1.49 ± 0.40 L before SA and 1.49 ± 0.41 L after SA (*p* = 0.838, NS). The Δ FEV₁ (%) value after RA

Table 1. Basic data and initial FEV₁ change in 16 patients after bronchodilator inhalation before acupuncture*

Sex, M:F	12:4
Age, yr (range)	63 \pm 11 (49–75)
Baseline FEV ₁ (L)	1.32 \pm 0.30
Baseline FEV ₁ /FVC (%)	55.1 \pm 14.83
FEV ₁ after bronchodilator (L)	1.70 \pm 0.36
Δ FEV ₁ (L) [†]	0.37 \pm 0.19
Δ FEV ₁ (%) [‡]	29.53 \pm 16.52

*Data presented as mean \pm standard deviation; [†] Δ FEV₁ = FEV₁ after bronchodilator – FEV₁ before bronchodilator; [‡] Δ FEV₁ (%) = $100 \times (\text{FEV}_1 \text{ after bronchodilator} - \text{FEV}_1 \text{ before bronchodilator}) / \text{FEV}_1 \text{ before bronchodilator}$. FEV₁ = forced expiratory volume in 1 second; FVC = forced vital capacity.

Table 2. Summary of FEV₁, FEV₁ change, and percentage change in FEV₁ before and after acupuncture*

	RA	SA
FEV ₁ before acupuncture (L)	1.52 ± 0.45	1.49 ± 0.40
FEV ₁ after acupuncture (L)	1.67 ± 0.40	1.49 ± 0.41
ΔFEV ₁ (L) [†]	0.15 ± 0.11	0.00 ± 0.12
ΔFEV ₁ (%) [‡]	11.57 ± 8.11	0.32 ± 7.76

*Data presented as mean ± standard deviation; [†]ΔFEV₁ = FEV₁ after acupuncture – FEV₁ before acupuncture; [‡]ΔFEV₁ (%) = 100 × (FEV₁ after acupuncture – FEV₁ before acupuncture)/FEV₁ before acupuncture. RA = real acupuncture; SA = sham acupuncture; FEV₁ = forced expiratory volume in 1 second.

Table 3. Statistical differences of baseline FEV₁, FEV₁ change, and percentage change in FEV₁ among real acupuncture (RA), sham acupuncture (SA) and initial inhalation bronchodilator before study

	<i>p</i> *
Baseline FEV ₁ of RA vs. SA	0.754
FEV ₁ before and after RA	0.0002
FEV ₁ before and after SA	0.838
FEV ₁ improvement of bronchodilator vs. RA	0.0006
FEV ₁ improvement of RA vs. SA	0.0007
ΔFEV ₁ (%) of RA vs. SA	0.0034
ΔFEV ₁ (%) of bronchodilator vs. RA	0.0001

*Paired *t* test. FEV₁ = forced expiratory volume in 1 second.

was better than that after SA (RA, 11.57 ± 8.11%; SA, 0.32 ± 7.76%; *p* = 0.003), while FEV₁ improvement from simple inhalation bronchodilator was better than that for RA (bronchodilator, 0.37 ± 0.19 L; RA, 0.15 ± 0.11 L; *p* < 0.001), and percentage change showed the same result (bronchodilator, 29.53 ± 16.52%; RA, 11.57 ± 8.11%; *p* < 0.001). The results of spirometry before and after acupuncture, along with ΔFEV₁ (%), are summarized in Table 2. The *p* values of statistical difference of FEV₁ and percentage changes following acupuncture and initial inhalation bronchodilator are summarized in Table 3.

Discussion

According to TCM, acupuncture is a suitable treatment for complex chronic diseases, including bronchial asthma. Each method of TCM, including exercise, massage, acupuncture, and herbal therapy, is considered to restore the balance of the human body, and acupuncture

is considered to be effective in the treatment of asthma in TCM.

Yu and Lee⁵ demonstrated the short-term acupuncture effect on bronchial asthma in 1976. Chu et al⁷ reported that asthma patients showed immediate bronchodilating response of FEV₁ after acupuncture, and a similar bronchodilator response was reproducible with repeated acupuncture. Takishima et al⁸ demonstrated that acupuncture caused a short-term reduction in airway resistance. However, the published data on this subject were controversial at first. Some studies were designed and performed to study short-term acupuncture effect on asthma and reported improvement of patients' wellbeing significantly during later years,⁶ while significant objective improvement of physiologic data from pulmonary function test was scanty in Kleijnen et al's review of 13 controlled trials in 1991⁹ and in Martin et al's meta-analysis of 11 randomized controlled trials in 2002.¹⁰ Multiple sets of acupoints have been used in many previous studies to relieve patients' asthma symptoms.

The clinical benefit of acupuncture on asthma patients from previous literature usually only demonstrated clinically subjective improvement, like clinical scores,⁶ while there was lack of objective improvement in spirometry in previous large-scale studies.^{6,11} The lack of a standard method of acupuncture stimulation and standard acupoints for asthma management may be one of the important causes of clinical inefficacy to prove the role of acupuncture in asthma management. Besides, the definition of somatosensation of *De Qi*, a sensation representative of effective application with soreness, numbness, fullness, and pain, is only a subjective feeling to indicate the proper adequate manual stimulation of acupuncture. Some placebo acupuncture stimulation may have a certain degree of acupuncture-like stimulation and associate with certain physiologic effects. Until now, we do not know which populations of asthma patients (different age, severity, acute or chronic asthma condition, and concurrent different medication use) will correlate with bronchodilating effect. We also have no idea about which acupoints and patterns of stimulation will result in greatest improvement of lung function. It seems difficult to perform a well-controlled study of the effective application of acupuncture in asthma patients.

In a recent prospective controlled study of 23 asthma patients whose FEV₁ were between 70% and 85% of predicted values, Shapira et al¹² reported no significant improvement in FEV₁ after 1 week of real acupuncture stimulation, and finally they concluded that a short course of acupuncture treatment resulted in no change in lung function in moderate persistent asthma.

In our study, a more senior population participated because our hospital is a veterans' hospital, and the older patients had more free time to visit at least 3 times within 2 weeks to complete the study. Patients with significant bronchodilating response ($>20\%$ improvement in FEV₁ after inhalation of bronchodilator) were selected to maximize the possible bronchodilating effect after RA stimulation. The selection of acupoints was based on our previous experiences. Twelve of the 16 studied patients had previous experience with acupuncture as an alternative method for their medical condition, and many of them had a good clinical experience. These patients may correlate with a better response to acupuncture than those without acupuncture experience. In order to have a stable baseline FEV₁ before RA and SA, all the performances were completed within 5 days and they had to have stable clinical symptoms and medication for asthma during the study. Statistically, there were no different FEV₁ values between baseline FEV₁ before RA and that before SA, while the improvement in FEV₁ was significantly greater after RA stimulation than after SA stimulation. The percentage change in FEV₁ values also indicated significantly better response in the RA group, but the degree of bronchodilating response after RA was less than that after use of inhalation bronchodilator.

According to our prospective randomized study, acupuncture at certain acupoints results in immediate physiologic improvement in FEV₁ in asthma patients. But inhalation bronchodilator still results in much better bronchodilating response than does acupuncture. Different points with different stimulation (intensity and duration) in different severity of asthma patients may be associated with different results and may be tried in the design of future asthma studies.

Acknowledgments

This study was supported by grants from Kaohsiung Veterans General Hospital, Kaohsiung, Taiwan (KSVG91-44 and VGHKS89-97).

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